Otte and Benke (2006) state that online learning is now reaching the core, helping to transform higher education and moving beyond isolated efforts to pervasive influence and change. The dichotomy of distance learning vs. campus-based education has broken down, and forward-looking senior administrators have embraced new approaches to education that contain the elements of successful online education while cultivating the community-building and branding of site-based education, particularly to promote enriched faculty and program development. Rather than being isolated in a distance learning task force or continuing education program, the conversations about online learning now occur—or need to occur—at the executive level and throughout other levels and structures. (p. 23)

In addition, Scarafiotti and Cleveland-Innes (2006) declare that higher education is engulfed in change. At the same time that institutions of higher education are endeavoring to transform themselves by integrating information and communication technologies into curriculum delivery, student profiles are changing. Low income-ethnic populations are among the fastest growing segment of 18–24 year old students; male enrollments are lagging in comparison to female; and the “digital natives” have arrived. Also, as the Internet provides students with access to a myriad of global educational opportunities, the potential for serving virtual foreign students increases. These changes present challenges and opportunities to institutions of higher education, which strive to serve their constituents through fully online and blended learning formats and aspire to extend education to new markets as well. (p. 33)

**Introduction**

The focus of this year’s White Paper on Teaching and Learning is teaching and technology in high education. Several themes have emerged during the scan of this topic area. These are:

1. technology expectations and the Net Generation;
2. faculty development and the Net Generation;
3. quality online teaching;
4. evaluating the effectiveness of online teaching and learning; and
5. a view of the future.

It should be noted that there are two dominant sources of the following information; both represent leaders in the use of technology for learning purposes. The first is EDUCAUSE. This non-profit organization has as its mission the advancement of higher education “by promoting the intelligent use of information technology.” The second is the Sloan Consortium (Sloan-C) whose purpose is “to help learning organizations continually improve quality, scale, and breadth of their online programs, according to their own distinctive missions, so that education will become a part of everyday life, accessible and affordable for everyone, anywhere, at any time, in a wide variety of disciplines.”

**Technology Expectations and the Net Generation**

Roberts (2005), a member of the Net Generation, divides expectations into two areas: technology expectations and learning expectations. In terms of technology expectations, for the Net Generations:

1. the definition of technology is not confined to computers or the Internet. Technology is viewed as any electronically based application or piece of equipment that meets a need for access to information or communication;
2. Customization is central to the definition of technology for Net Generations. Technology is something that adapts to their needs, not something that requires them to change (p. 3.1).
Net Geners have “learning expectations that begin with the expertise and passion of the faculty member” (p. 3.3), and they “have high expectations for faculty members’ technology knowledge and skills” (pp. 3.3-3.4). Roberts (2005) cites research data in which students rated as “most important” to successful learning:

1. the professor’s experience and expertise;
2. the professor’s ability to customize the class using the current technology available (for example: Courseweb, Blackboard, and so forth); and
3. the professor’s ability to professionally convey lecture points using contemporary software (for example, PowerPoint)” (p. 3.4).

Research by Windham (2005) stresses the need to meet Net Geners who are (1) driven to succeed, (2) driven by compassion, (3) driven by hope, (4) highly influenced by Father Google and Mother IM, and (6) technological masters. Windham (2005) points to the traditional classroom where Net Geners want (1) interaction, (2) exploration, (3) relevancy, (4) multimedia, and (5) instruction. For online courses, these same criteria stand in addition to the need for “discipline, engagement, and interaction” (p. 5.10).

Aviles, Phillips, Rosenblatt, and Vargas (2005) summarize the perceptions of Net Geners regarding typical educational practices in higher education as they relate to technology in the classroom. These statements represent advise to faculty on how to each and advise to administrators on how to prepare faculty for teaching. As one Net Gener states, “If you’re going to make me go to class, make it worth my while. Don’t stand there and read from PowerPoint Slides that I can download from your Web site. Don’t sit there and read the book to me. I can do that on my own. Provide me with something I can’t get on my own. And, make us responsible for our own learning” (pp. 27-28). Another comments, “If higher education listened to me, faculty and administrators would understand that students today cannot be dedicated just to learning. We have other responsibilities. We have other things that we have to do. Technology, if used correctly, can help. Technology isn’t perfect. I think all of us realize that, but it can be used to enhance our university experience. It can be a good way of communicating, of allowing all of us – students, faculty, staff, and administrators – to communicate with each other. Technology can make a big university seem personal, like it’s a small community, like it’s connected to me” (p. 28). The web-based ELI is an excellent resource for all of higher education and can be found at: http://www.educause.edu/SuccessfulLearning/6796.

Prensky (2005) makes two very profound statements about the students of today. First, “all the students we teach have something in their lives that’s really engaging – something that they do and that they are good at, something that has an engaging, creative component” (p. 62). And, “students certainly don’t have short attention spans for their games, movies, music, or Internet surfing. More and more, they just don’t tolerate the old ways – and they are enraged we are not doing better by them” (p. 64).

Messineo and DeOllos (2005) report the results of a survey of 233 students at a medium-sized Midwestern university. Their survey was intended to help an academic department best utilize information technology within its curriculum. “Results show that student view their computer competence differently depending on whether they are using the technology for personal or course-related tasks. Additionally, while the expressed levels of experience and comfort are high
for some forms of technology, exposure and confidence with more advanced applications are lacking. Such findings suggest that faculty members may make false assumptions about student preparedness and, in turn, may jeopardize student success. Differences by gender and race/ethnicity also were observed, suggesting that departments need to be aware of the varied experiences of their students” (p. 50). Without a doubt, institutions need to be aware of the computer competence of their incoming students.

Oblinger (2005) concludes that “the next generation of learners will demand to be engaged – something they currently find in their daily activities but perhaps not in school” (p. 69). From this, she specifies four lessons:

1. Learning technology cannot bring value independent of the learner (p. 69);
2. Learning theory translated into practice, along with an understanding of learners, helps ensure successful learning (p. 71);
3. It is not technology that is most important but the activity it enables; the activity, not the technology, is what advances learning (p. 74);
4. The goal of ELI [EDUCAUSE Learning Initiative] is to help institutions understand learners, learning principles, and learning technologies to ensure successful learning. (p. 75)

Kiernan (2005) reports the results of a survey of 18,039 freshmen and seniors at 63 institutions. The results include:

1. forty-one percent of students said they preferred their professors to make moderate use of information technology. By comparison, 26 percent said they preferred only limited use, while 27 percent sought extensive use;
2. students in the survey most commonly said that convenience was the primary benefit of use of technology in courses. They cited ‘connectedness; second;
3. few students cited improved learning as a benefit of technology, but that doesn’t mean that the technology didn’t help them learn more… ‘convenience and connected contribute to learning;
4. virtually all of the students said that they used their computers for writing documents, handling email, and surfing the Web. Three quarters said they used a computer to download or listen to music, while 24 percent said that they used a computer to create and edit video or audio files;
5. ninety-six percent of the respondents said that they owned at least one computer. Desktop computers lost out in popularity to laptops, which 56 percent of respondents owned. That is a nine-percentage-point increase in laptop ownership compared with a survey last year.”

**Faculty Development and the Net Generation**

A study by Dewey and DeBlois (2006) surveyed the CIOs of higher education member institutions (both public and private) and reported the top-10 IT issues for this year. Two issues are of particular interest to this White Paper. First, #5 is Faculty Development, Support, and Training. “With the new technology offerings and the changes in students’ expectations, IT organizations will undoubtedly continue to face the strategic challenge of making the technologies available, usable, and scalable for faculty and of providing comprehensive faculty support and training” (p. 72). Second, #9 is E-Learning/Distributed Teaching and Learning.
“Increasing numbers of postsecondary schools are taking advantage of the wide range of computing and communications technologies that provide learning opportunities far beyond the time and place constraints of the traditional classroom. E-learning has emerged from its beginnings as an add-on to traditional education and has now become a mission-critical component of the educational environment” (p. 76).

Moore, Moore, and Fowler (2005) emphasize the need for faculty development in the face of the Net Generation. The development program that they represent was designed to respond to the following characteristics of Net Generals:

1. life online;
2. rapid communication;
3. social networking;
4. games and simulations; and
5. digital literacy (p. 11.2).

They cite the National Research Council’s (1999) “FIT” (fluency in information technology) initiative as foundational to an institution’s strategic planning. “FITness requires three kinds of knowledge:

1. Contemporary skills – the ability to use today’s computer applications, enabling people to apply information technology immediately. Skills are an essential component of job readiness. Most importantly, skills provide a store of practical experience on which to build new competence.
2. Foundational concepts – the basic principles and ideas of computers, networks, and information that underpin the technology. Concepts explain the how and why of information technology, and they give insight into its opportunities and limitations. Concepts are the raw material for understanding IT as it evolves.
3. Intellectual capabilities – the ability to apply information technology in complex situations, encapsulating higher-level thinking in the context of IT.

These capabilities empower people to manipulate the medium to their advantage and to handle unintended and unexpected problems when they arise. Intellectual capabilities foster more abstract thinking about information and its manipulation” (p. 11.3). Moore, Moore, and Fowler (2005) stress that “an institution’s strategic plan and teaching and learning activities should contain appropriate goals for becoming FIT. Faculty and staff who do not have the requisite knowledge and skills to work toward fluency in information technology may need professional development programs that help them achieve FITness in their teaching and research” (p. 11.3).

Hartman, Moskal, and Dziuban (2005) discuss what is necessary to prepare “the academy of today for the learner of tomorrow” (p. 6.1). In their review of teaching excellence across Baby Boomers (born 1946-1964), Generation X’ers (born 1965-1980), and Net Generals (born 1981-1994), they state that “although students’ behaviors, attitudes, and expectations are generally shaped by their generation, what constitutes good teaching appears universal across these generations. Students believe that excellent instructors:

1. facilitate student learning;
2. communicate ideas and information effectively;
3. demonstrate genuine interest in student learning;
4. organize their courses effectively;
5. show respect and concern for their students; and
(6) assess student progress fairly and effectively” (p. 6.11).

They conclude that “the Net Generation possesses sophisticated technological adaptability and a remarkable capacity to incorporate multitasking into day-to-day academic activities. However, there is also a growing discrepancy between institutional infrastructure and these students’ personalized facility with information” (p. 6.11). And, they conclude by saying that “To bridge the gap between faculty expertise and student needs, institutions must address awareness, enablement, and integration: Awareness of students’ approaches to meeting their learning needs and of what technologies are available to them; Enablement through professional development so they have the skills needed to implement systematic change; and Integration, or the ability to bring together the disparate pieces needed – pedagogy, learning space design, technology, support, policies – to enable successful learning” (pp. 11.3-11.4).

Riedinger and Rosenberg (2006) discuss the implementation of an online certification course for online teaching. The advantages of this certificate program evolved from faculty characteristics, the necessity of training faculty to deliver content in this new way, and the magnitude of preparing a broad range of faculty who are spread across the globe. The learning outcomes for faculty taking this “course” are:

(1) understand and implement basic pedagogical principles of successful online courses;
(2) understand the best practices of online education, including quick turnaround time and developing an effective teaching personality;
(3) demonstrate the ability to implement and utilize all basic course management software functions; (4) competently manage and facilitate an online course conference;
(5) set up and populate lecture folders using folders, learning units, and items to present lecture material;
(6) fully utilize the functionality of the Blackboard Gradebook, Digital Drop Box, Resources, and Groups; and
(7) Create tests and deploy them appropriately within the course. (p.35)

Efaw (2005) presents the model for how to teach with technology used at the United States Military Academy at West Point. “The first phase encompasses training in available technology, classroom modeling of technology, learning how to encourage student participation, and initial feedback from experienced instructors” (p. 28). The model uses summer faculty development workshops. The model uses evidence from Abbot and Farris (2000) and Zhao (2002) to support a process whereby faculty receive introductory training on the uses and capabilities of computers and then where faculty learn how to use the appropriate applications (p. 28). Key to infusion of technology into teaching is “observing other faculty while they use technology applications in the classroom in interesting ways” (p. 28) and “actually completing assignments and engaging in course activities that require technology skills” (p. 29). Ongoing development is also very important in successful integration.

Mercurius (2006) suggests that the digital-age leader should:
(1) follow the lead of businesses to realize more benefits from technology;
(2) allow technology leaders to join the decision-making team;
(3) integrate effective use of technology in all academic disciplines;
(4) provide on-going staff development on integrating technology in all academic disciplines.

In addition, Mercurius (2006) describes successful digital-age leaders as:
(1) knowledgeable and literate in their field;
(2) systematic and strategic thinkers;
(3) successful at implementing major projects or programs;
(4) able to communicate, motivate, and cultivate;
(5) confident in making important decisions with limited data;
(6) self-assured;
(7) attuned to the values and benefits of globalization; and
(8) infused with technology savvy.”

Trinkle (2005) describes the transformation of DePauw University in Greencastle, Indiana. “Several years ago, DePauw faculty, students, and staff recognized the potential of technology to enrich learning and grasped that DePauw’s historic mission as a liberal arts college required graduating students prepared to succeed and thrive in a broadly digital culture” (p. 18). The “10 Key Factors for Success” at DePauw are:
(1) put learning first;
(2) align IT with institutional mission and culture;
(3) technology fluency is the new liberal art;
(4) invest more in people and support than in hardware and software;
(5) good enough is good enough;
(6) support sustainable technologies;
(7) actively involve students;
(8) collaboration is essential;
(9) use technology to remove barriers;
(10) design space to enhance learning and build community. (p. 20)

Most importantly, Trinkle (2005) stresses that “a central catalyst for DePauw’s success is investing heavily to provide faculty and students with the support and training they need to learn and use technology effectively” (p. 21).

Clayton-Pedersen and O’Neill (2005) discuss “curricula designed to meet 21st century expectations.” They state that “students’ personal experience with technology is typically broad and in many cases very deep. Moreover, their extensive use of technology continues throughout their college experience – that is, except fully integrated into the curriculum” (p. 9.2). This has the following implications for higher education:
(1) faculty’s understanding of the teaching and learning power of technology needs to be increased;
(2) increasing the use of technology will increase demands for technological tools to be effectively integrated into the curriculum to enhance student learning;
(3) tools need to be developed to help faculty integrate technology into the curriculum. (p. 9.2)

In terms of 21st century expectations for students, there are the following implications:
(1) better alignment is needed between higher education’s communication of its purposes and what K-12 education, parents, and the community perceive as its purpose;
(2) communication needs to include better uses of technology to assess high-quality education environments. (p. 9.4)

In terms of 21st century expectations for the curriculum, there are the following implications:
much of the learning technology innovation in higher education has been focused on K-12 teacher preparation and development. More focus needs to be placed on preparing existing faculty for the future Net Generation students who will populate the 21st century classroom;

(2) to the extent that colleges and universities involve interested faculty and students in working together to develop tools that truly engage them both, the more fruitful their efforts are likely to be for the larger higher education community” (p. 9.5).

In terms of 21st century expectations for technology, there are the following implications:

(1) institutions need to establish greater expectations for maximizing their investment in technology by exploring and assessing the best use of technology for learning;

(2) greater investments may be needed in faculty professional development in the effective use of technology for learning;

(3) faculty’s effort to infuse technology into the curriculum requires support in developing strategies and in resolving technical difficulties. This means more than the technical help desk. What is needed is assistance for using technology to achieve the teaching and learning outcomes we desire” (p. 9.6).

Finally, the implications for technology and the curriculum of the 21st century include:

(1) there is a need for integrating technology that is in the service of learning throughout the curriculum;

(2) more intentional use of technology to capture what students know and are able to integrate in their learning is needed. (p. 9.12)

Quality Online Teaching

Keeton (2004) compared face-to-face learning to online learning. He presents the classic principles of good face-to-face teaching provided by Chickering and Gamson (1987) and those of Keeton, Sheckley, and Krejci-Griggs (KS&G) (2002) and examines how best practices in online instruction are similar to these face-to-face practices. Compared to the established principles of best practices in face-to-face teaching, Keeton (2004) reports that

(1) the individual instructor’s effectiveness in applying the eight principles of (KS&G) is a major factor in adult students’ learning and persistence;

(2) students need support additional to that of a syllabus in understanding and pursuing the learning objectives of a course or other educational effort;

(3) students in online courses expect faculty to be more readily and promptly available at non-class times than face-to-face students expect faculty in responding to the students’ communications;

(4) the most effective faculty actively use five or more of the full array of instructional principles so they can elicit the largest learning effects;

(5) faculty agreed that teaching well online is more time-consuming that teaching face-to-face. (p. 77)

Evaluating the Effectiveness of Online Teaching and Learning

Allen, Mabry, Mattrey, Bourhis, Titsworth, and Burrell (2004) conducted an extensive review of articles related to online teaching and learning. They used “meta-analysis to summarize the quantitative literature comparing the performance of students in distance education versus
tradition is proven, the average effect (average $r = .048$, $k = 39$, $N = 71,731$) demonstrates that distance education course students slightly outperformed traditional students on exams and course grades. The average effect was heterogeneous, and the examination of several moderating features (presence or absence of simultaneous interaction, type of channel used in distance education, and course substance) failed to produce a homogeneous solution. The results demonstrate, however, no clear decline in educational effectiveness when using distance education technology” (p. 402).

Achacoso (2003) makes seven recommendations for conducting future evaluations of technology-mediated instruction at the University of Texas, but these recommendations would seem to hold true for any campus:

1. develop a means of accounting for the per-credit-hour technology fee students are charged to determine who the fund is being allocated;
2. establish goals for technology use on campus. What are the short-term and long-term plans for technology use? Evaluation must be linked to these goals.
3. establish goals and outcomes for technology and evaluation for [instructional innovation and assessment]. What are the desired technology outcomes for the [various instructional programs]?;
4. connect the use and study of learning technologies to good, sound pedagogical and cognitive principles;
5. choose methodology appropriately;
6. continue to conduct implementation evaluations; and
7. use formative evaluations, during program implementation, because of their importance in the face of rapid technology changes. (pp. 5-6)

Rovai and Barnum (2003) analyzed nineteen online graduate courses “in order to determine how perceived learning varies by course and its relationship to active and passive participation by students in online discussions” (p. 57). They report the results of their study by stating: “study results provided evidence that significant differences existed by course, suggesting that quality assurance is an issue in internet-based instruction. Moreover, female students felt that they learned more than their male counterparts. Only active interaction, operationalized by the number of messages posted by students per week, was a significant predictor of perceived learning. Passive interaction, analogous to listening to but not participating in discussions and operationalized by the number of accesses to the discussion boards of the e-learning system each week, was not significant” (p. 57).

A View of the Future

Allen and Seaman (2005) present five questions about online education in the United States and provide empirical evidence in the form of responses from chief academic administrators and faculty to each question.

1. Have the course and program offerings in online education entered the mainstream? –
   The evidence: The answer to this question appears to clearly be “Yes:” schools are offering a large number of online courses, and there is great diversity in the courses and the programs being offered: (a) sixty-five percent of schools offering graduate face-to-face courses also offer graduate online courses; (b) sixty-three percent of schools offering undergraduate face-
to-face courses also offer undergraduate courses online; (c) among all schools offering face-to-face master’s degree programs, 44% also offer master’s programs online; (d) among all schools offering face-to-face business degree programs, 43% also offer online business programs. (p. 1)

(2) Who is teaching online? – The evidence: Staffing for online courses does not come at the expense of core faculty. Institutions use about the same mixture of core and adjunct faculty to staff their online courses as they do for their face-to-face courses. Instead of more adjunct faculty teaching online courses, the opposite is found; overall, there is a slightly greater use of core faculty for teaching online than face-to-face: (a) sixty-five percent of higher education institutions report that they are using primarily core faculty to teach their online courses compared to 62% that report they are using primarily core faculty to teach their face-to-face courses; (b) seventy-four percent of public colleges report that their online courses are taught by core faculty, as opposed to only 61% for their face-to-face courses; (c) except for the largest schools (15000+ enrollment), all sized schools report an equal or greater rate of online courses being taught primarily by core faculty compared to their face-to-face courses. (p. 2)

(3) Is online education becoming part of long-term strategy for most schools? – The evidence: the evidence from higher education’s academic leaders suggests that there is a strong trend upwards in considering online education as part of a school’s long-term strategy. While there is some diversity in response to this question, there is growth among all types of schools: (a) the overall percent of schools identifying online education as a critical long-term strategy grew from 49% in 2003 to 56% in 2005; (b) the largest increases were seen in associate’s degree institutions where 72% now agree that it is part of their institution’s long-term strategy, up from 58% in 2003; (c) the smallest schools, private nonprofit institutions and baccalaureate colleges remain the least likely to agree that online education is part of their long-term strategy. (p. 2)

(4) Have online enrollments continued their rapid growth? – The evidence: Growth has continued at a healthy rate, but not as rapid as last year. The increase in the overall number of online learners was the same this year as last (an increase of around 360,000 each year) for an overall enrollment growth rate of 18.2%. This growth rate greatly exceeds the overall growth rate in the higher education student body: (a) overall online enrollment increased from 1.98 million in 2003 to 2.35 million in 2004; (b) the online enrollment growth rate is over ten times that projected by the National Center for Education Statistics for the general postsecondary student population; (c) in the aggregate, survey respondents do a reasonable job of predicting changes in online enrollments, but individual schools were often inaccurate in their 2003 predictions of their 2004 online enrollments. (p. 3)

(5) What else do chief academic officers and faculty believe about online education? – The evidence: There is some good news for online education, but the opinions of chief academic officers also raise a number of challenges. On the positive side, they believe it is no harder to evaluate online courses than those delivered face-to-face. More challenging, however, is that academic leaders believe that online courses require more effort for faculty and more discipline by students, and many of them continue to believe that their faculty have not accepted the value of online education: (a) chief academic officers believe, in general, that it takes more effort to teach online; (b) a large majority of respondents (64%) believe that it takes more discipline for a student to succeed in an online course; (c) although online education continues to penetrate into all types of institutions, a relatively stable minority of
chief academic officers (28% in 2003 compared with 31% in 2005) continue to believe that their faculty fully accept the value and legitimacy of online education; (c) eighty-two percent of respondents believe that it is no more difficult to evaluate the quality of an online course than one delivered face-to-face. (p. 3)

The Horizon Report: 2006 Edition is a joint effort between the New Media Consortium and the EDUCAUSE Learning Initiative. It presents a forecast of the trends that are influencing teaching and learning in higher education. In terms “key trends,” the following are mentioned:

1. “dynamic knowledge creation and social computing tools and processes are becoming more widespread and accepted” (p. 3);
2. “mobile and personal technology is increasingly being viewed as a delivery platform for services of all kinds” (p.3);
3. “consumers are increasingly expecting individualized services, tools and experiences, and open access to media, knowledge, information, and learning” (p.3); and
4. “collaboration is increasingly seen as critical across the range of educational activities, including intra- and inter-institutional activities of any size or scope” (p. 4).

“Critical challenges” for technology and learning that are on the horizon are:

1. “peer review and other academic processes, such as promotion and tenure reviews, increasingly do not reflect the ways scholarship actually is conducted” (p. 4);
2. “information literacy should not be considered a given, even among ‘net-gen’ students” (p. 4);
3. “intellectual property concerns and the management of digital rights and assets continue to loom as largely unaddressed issues” (p. 4);
4. “the typical approach of experimentally deploying new technologies on campuses does not include processes to quickly scale them up to broad usage when they work, and often creates its own obstacles to full deployment” (p. 4);
5. “The phenomenon of technological ‘churn’ is bringing new kinds of support challenges” (p. 4).

“Technologies to watch” are technologies that are on the horizon and are in need of adoption by higher education. They are:

- **Time-to-Adoption: One Year or Less**
  - Social Computing = “The application of computer technology to facilitate interaction and collaboration, a practice known as social computing, is happening all around us. Replacing face-to-face meetings with virtual collaboration tools, working on a daily basis with colleagues a thousand miles away, or attending a conference held entirely online is no longer unusual. An interesting aspect of social computing is the development of shared taxonomies – folksonomies – that emerge organically from like-minded groups” (p. 5)
  - Personal Broadcasting = “With roots in text-based media (personal websites and blogs), personal broadcasting of audio and video material is a natural outgrowth of a popular trend made possible by increasingly more capable portable tools. From podcasting to video blogging (vlogging), personal broadcasting is already impacting campuses and museum audiences significantly” (p. 5).

- **Time-to-Adoption: Two to Three Year**
  - The Phones in Their Pockets = “A little further out on the horizon, but rapidly approaching, the delivery of educational content and services to cell phones is just
around the corner. Among the keys that will unlock the true potential of this technology are improved network speeds, Flash Lite, and video: as new features that take advantage of the capabilities of these appear in phones, barriers to delivery of educational content will vanish” (p. 5).

Educational Gaming = “A recent surge in interest in educational gaming has let to increased research into gaming and engagement theory, the effect of using games in practice, and the structure of cooperation in gameplay. The serious implications of gaming are still unfolding, but we are not far away from seeing what games can really teach us” (p. 5).

Time-to-Adoption: Four to Five Years

Augmented Reality and Enhanced Visualization = “Currently in use in disciplines such as medicine, engineering, and archaeology, these technologies for bringing large data sets to live have the potential to literally change the way we see the world by creating three-dimensional representations of abstract data” (p. 5).

Context-Aware Environments and Devices = “Advancements in context-aware computing are giving rise to devices and rooms that respond to voice, motion, or other subtle signals. In the ultimate application of these technologies, the ‘computing’ part simply disappears, leaving an environment transparently responsive to its human occupants” (pp. 5-6).

References


Achacoso, M. (2003). *Evaluating technology and instruction: Literature review and recommendations*. Austin, TX: The University of Texas at Austin, Division of Instructional Innovation and Assessment.


**Additional Resources**

EDUCAUSE Reading on Faculty Development, Support, and Training (Dewey and DeBlois, 2006):


EDUCAUSE Readings on E-Learning/Distributed Teaching and Learning (Dewey and DeBlois, 2006):


EDUCAUSE Learning Initiative. Various Resources.


